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EDITORIAL NOTES

WESTVERTICALS IN ACTION

LAST Friday, in a Paper to the Eastern Counties' Association, the General Manager and Chief Engineer of a gas undertaking somewhere in England gave an account of the working results of an installation of Westvertical retorts over a period of 6½ years. The installation is a large one giving a gas output of 3 million cu.ft. a day, and it represents a new system of carbonization designed to obtain the advantages in a totally enclosed system of intermittent carbonization combined with continuous steaming and the discharge of cooled coke. The results of its operation, carefully set out in an eminently practical Paper, are obviously of first interest to all gas engineers, and will be studied very closely. The contribution gave rise to a full discussion, a report of which, together with an abstract of the Paper, will be found in to-day's "JOURNAL." The discussion was of an operational rather than of a fundamental nature; a welcome feature was the experience outlined by some of the speakers of the working of a plant designed with similar objects in view—namely the Woodall-Duckham static vertical retort.

The Westvertical carbonizing unit is completely enclosed from the gas-tight valve at the top to the discharging door at the bottom. Dust and smoke incidental to the charging of coal and the discharge of coke—cooled coke, it should be emphasized—are reduced to a minimum. The system meets the requirement that it should not have any detrimental effect on the amenities and cleanliness of the surrounding property. The carbonizing unit (actually we have described the principle previously in our abstracts of patent specifications covering the process, but we outline it here for clarity of this note) may be regarded as divided into three zones of a long retort. A coke-cooling zone, which is extensive, is superimposed by a short "conversion zone" in which the coke is maintained at a temperature sufficient for the water gas reaction. Above this is the carbonizing zone in which the carbonization of the coal charge takes place. Operation is thus: At the end of the carbonizing period a cut-off at the top of the coke discharging is closed, the discharging door at the bottom is opened, the coke passes to a conveyor. Whereupon the discharging door is closed, the cut-off opened, and the charge is allowed to drop into the discharging chamber. The process is repeated, leaving the two lower zones filled with hot coke and the top carbonizing zone ready to receive the new charge. The coal valve is opened, coal flows to within a predetermined distance from the top of the mouthpiece of the retort, the coal valve is closed—and carbonizing begins again. The principle will be readily understood from the diagram we reproduce on p. 218. Of course, cyclic operation of individual retorts ensures continuity of the system as a whole.

The General Manager and Chief Engineer, introducing his frank and useful contribution to current knowledge of carbonizing practice, stressed the reasons for his decision to install Westverticals. Cleanliness of operation was a major factor, and the plant ensured this. Cooled coke was a desideratum; again the plant satisfied the demand. Conditions for the men who would have to operate the plant were good—a point which the Author emphasized was important at the time of the plant's erection and would be no less important in the future. We thoroughly agree. There was the question of gas "characteristics." The common main into which it was intended to direct the gas—that is, the common distribution main—was being served by horizontal retorts and water gas plants. It was felt that the gas "characteristics" from the Westvertical retorts would not disturb current working of the various types of appliance on the district. For ourselves, we are not sure to what extent this consideration should influence the choice of carbonizing plant. But—and this, we think, is a point which should be stressed; we quote from the Paper itself—"the characteristics of the coke were of special concern, for they should not differ materially from those of the coke already being sold by the undertaking, since no facilities existed for keeping the different kinds separate." The more we think about this statement the greater its significance grows. It was a consideration, by the way, emphasized by the Author in his introductory remarks at the meeting at which he presented his Paper. It was a matter of "special concern." What does this imply?

It is not our purpose to answer the foregoing question. The answer must come from those who are responsible for the running of gas undertakings and the operation of gas-works—*i.e.*, General Managers and Chief Engineers. Thoughts must, however, arise from it. Is the choice of carbonizing plants on a gas-works, the primary function of which, we take it, is to make gas, to be decided largely on the type of coke which it will produce? Is the choice of plant to be influenced by the fact that any gas-works has not available storage facilities for different qualities of coke? Has local usage of a dense coke to be a determining factor? Even in a district which has become accustomed to a dense coke, is there no place—provided the market is scoured and efficiently served—for a lighter coke of a freer-burning nature more suited for the open coke firegrate? Considerations such as these were not discussed at the meeting last Friday, but we think they are fundamental. The "special concern" about the coke market mentioned by the Author of the Paper in question certainly added weight to the argument which we have tried to drive home for years in these columns, that a cheap gaseous therm depends on a remunerative coke market. This market can be made remunerative, and it is a market which covers many types of coke, dense and otherwise—in the long run, perhaps, more otherwise than dense.

Let us turn to a few of the practical points in the Author's straightforward outline of experience of a new type of plant, which has been described as a half-way house between an installation of continuous vertical retorts and an installation of intermittent vertical retorts. "Halfway house" is not, we think, an apt expression. The Westvertical plant is not in any sense a halfway house in ensuring decent amenities and the cleanliness of surrounding property, and it gives a cooled coke. With regard to gas, coke, and tar quality produced, however, we assume that the analogy serves as a very broad generalization. Maintenance costs given by the Author for the Westvertical plant in question are high; they are, in fact, higher than might have been anticipated. But the Author was at pains to emphasize the causes for this, and his explanation and qualifications should be borne in mind. In any case the figures apply to a pioneer plant of the size and under the conditions, and should be assessed accordingly. During the period of operation covered—as we have said, 6½ years—yields of products have consistently fulfilled the Author's expectations and operating costs have been within his estimates. As the older systems of carbonization have had their difficulties, so this new development in carbonization has brought its peculiar problems. We are brought to the Author's expression of confidence that the knowledge and experience which have been accumulated will ensure improvements to a "system which will ultimately become an established method of carbonizing on works producing up to 10 million therms per year."

We mentioned previously that the discussion was concerned to a large extent with matters of operation. We should have liked to hear discussed as a major consideration the fuel require-

ments of the plant in relation to other known methods of gas-making, and as something of a corollary to this, more concentration on the amount of steam surplus to all retort house needs—viz., 640 lb. per ton, assessed at 1s. 6d. per 1,000 lb. in the final table in the Paper giving the costs of manufacture per therm of gas made. This surplus, the Author explained at the meeting, represented 40% of the steam made by the plant; it was, he said, available throughout the 24 hours and was useful. He added that the works had a high steam consumption. Granted this, we are faced with the question whether it is altogether economically sound to produce 40% of surplus steam, assessed at 1s. 6d. per 1,000 lb., in a gas-making plant. Others will doubtless ponder over this by no means unimportant matter, querying, perhaps, whether steam cannot be produced more economically for general gas-works purposes.

We feel it is impossible properly to conclude this short comment on an important technical contribution giving so freely and fully to the Industry the working results over a long period of a new system of carbonization sponsored by well-tried, fully-experienced, and acknowledged experts in the field of gas-works carbonization—West's Gas Improvement Company—without saying that it exemplifies excellently the development of plant through the goodwill which exists between gas engineers who are responsible for the supply of gas to the public and the constructors of plant. This is a bright feature, the importance of which can hardly be over-exaggerated. We shall welcome any further information which the Author may see fit to give in the light of points raised in the discussion, for his reply to which the time available at the Meeting was all too short.

SMOKELESS FUEL POST-WAR

ACTIVITY continues on the smokeless fuel discussion front. Last week the Institute of Fuel discussed a Paper by Dr. G. E. Foxwell on the provision of smokeless fuel for post-war construction, and it was valuable to have opinions from the broad front of the fuel industries as a whole as distinct from any one section of this front. The Author dealt with his subject from three major angles—smoke abolition, coal conservation, and the provision of a better heating service from smokeless fuels, gas and coke, at a price which the vast majority of the people of the country can afford to pay. On the fuel conservation count, he ruled out electricity for heating purposes as a general solution of the problem, maintaining that the carbonizing industries are best suited to supply the bulk of the smokeless fuel required after the war to satisfy a programme based on smokelessness and coal conservation. Adequate quantities of smokeless fuels, he argued, could be made available by carbonization if the Gas Industry and colliery-owned plants collaborated fully through regional gas grids; and he made the point that improved architectural housing design is essential if fuel is to be used efficiently.

Let us take a glance at the discussion, which indicated along what lines the various fuel interests are thinking and also the trend of thought of at any rate some architects and some users. The arguments were advanced with vigour. From the coal angle it was maintained that it was absurd to imagine that a coke-cum-gas heating system could possibly cope with winter peak demands, that it was the storage of coal for the winter months which made it possible to carry the winter load, regarding which there was much wishful thinking. Again from the coal angle we had remarks such as the purpose of the mining industry is to serve the public; its job is to satisfy public demand. Why should the public be denied the open coal fire? Alternatively, if it wanted smokeless fuel, the Industry would, or might, be able to supply the demand—but at all costs let us get away, post-war, from regimentation. From the coal appliance makers' angle we had an able speech on the virtues of the underfeed stoker for the central heating of private houses as well as public buildings. Let us have central heating and open fireplaces, central heating as a basic heating load, central heating fired by bituminous coal burned without smoke and needing a minimum of labour. Let us abandon thoughts of ideal houses for the future which were neither more nor less than stepdaughters of second-class English provincial hotels replete with prepayment gas fires and cold walls. Radiant heat and wall cooling might look good, but, to the occupant of the room, felt bad. It was roundly asserted that the opinion often expressed that the heat passed to a flue by a solid fuel fire was wasted is untrue—or at any rate, if the flue is internally positioned, is untrue. Moral, position the flue inside the building and enjoy some basic warmth—the comfort of a building heated structurally. As to the expression "coke boiler," what was a coke boiler? It was an appliance which would operate perfectly well on anthracite or other natural smokeless fuels. And what about closed stoves, burning solid fuels smokelessly, and operating at a thermal efficiency of from 60–75%? And let the carbonizing industries beware. If the domestic market passed from the coal industry it was inevitable that the prices of coal for other purposes would advance.

It was argued that British homes may have been designed to be lived in, but they certainly had not been designed to be heated economically; that with insulation of buildings fuel consumption to maintain present standards of heating could be reduced by 50%, alternatively that with the same fuel consumption we could enjoy a 50% better heating standard. Regarding storage of solid fuels, it was remarked that coke is a solid fuel and can be stored just as coal can be stored, and it was maintained that the open grate burning bituminous coal is doomed on grounds of fuel conservation. Another argument was put forward—that the British climate demands great flexibility of heating arrangements for houses, that the future will witness a greater demand for intermittent heating, that the occupiers of homes in the future will not for the most part be prepared to pay for central heating when in fact they might occupy these homes for only a few hours during the day. From which medley of argument we are left wondering what is the objective of each section of the fuel industries, and how the Gas Industry's future place in domestic heating is conjectured by the other interests concerned.

The Tar Industry

At the recent monthly meeting of the Executive Committee of the Association of Tar Distillers the President explained that he had completed visits to the eight regions into which the Industry was divided, and was preparing to discuss further with the chairmen of the regions the subject of organization of the industry which had been the primary topic for examination in his discussions with the separate regions. The Committee agreed that the tar distilling industry should co-operate on a regional basis with the Association of British Chemical Manufacturers in respect of fuel efficiency and economy, that Association having arranged for District Committees working in close co-operation with the Ministry of Fuel and Power. We learn that the Committee has also agreed that a careful investigation shall be made into the depreciation allowance for income tax purposes in respect of tar distillation plant with a view to representations for an improvement in the allowance. Among other matters dealt with at the meeting, arrangements were reported for the carrying out of full scale tests of roofing materials based on pitch, while on the general question of the replacement of imported materials by pitch for building and allied construction it was noted that the active co-operation of users of imported material was in ample evidence.

Gas Engineering Advisory Boards

At the meeting of the Eastern Counties Gas Engineers' and Managers' Association on Friday last, a report of which appears in our columns to-day, Mr. E. V. Evans, President of The Institution of Gas Engineers, was invited to speak on the formation of the Gas Engineering Advisory Boards. He explained that it had been suggested to the Institution that a most useful purpose would be served if there existed in all parts of the country Gas Engineering Advisory Panels similar to that of the Midland Association. Thus the Council of the Institution recommended that its General Purposes Committee should meet two representatives nominated from each of the Affiliated Associations to receive a report of the Midland Advisory Panel and consider the desirability of extending the system to the whole of the country. At this meeting it was decided unanimously to proceed with the matter. Concurrently Dr. E. W. Smith (Director-General of Gas Supply) had been impressed, in the interests of fuel economy and the maintenance of the supply

of gas, with the necessity of extending this district panel scheme. Dr. Smith was invited, therefore, to attend the meeting called by the Institution. He had on several occasions expressed the opinion that as far as possible the Gas Industry should manage itself, but he made it clear that the necessity for these panels was such that, failing their creation by the Industry, the Ministry would have to take steps to evolve an organization capable of controlling fuel economy and of maintaining supplies of gas. "I feel," said Mr. Evans, "that it would be your unanimous wish that our Industry should control itself, and it is a happy coincidence that the Gas Engineering Advisory Boards we hope to set up in all Civil Defence Areas will serve to assist the Director-General in his responsibilities to his Minister and to make a further contribution to the winning of the war."

Damage to Public Utility Undertakings

An outline of proposals for the further legislation needed to provides for payments in respect of war damage to, and contributions from, undertakings covered by Section 40 of the War Damage Act, 1941, was given in the House of Commons in a statement on May 29, 1941. A Memorandum published last week (Cmd. 6403, War Damage to Public Utilities, &c.; H.M. Stationery Office, price 3d.) states that the consultations foreshadowed with representatives of public utility undertakings have proved most valuable, and though they are not yet complete, it is thought that the further discussions which remain to take place before it will be possible to introduce a Bill into Parliament would be assisted by a fuller analysis, in more detail than was possible at the time of the statement of May 29, of the subject as it presents itself in the light of the consultations so far held.

The general effect of Section 40 of the principal Act was to except certain types of undertakings from the operation of Part I of the Act pending further legislation. The section applies to statutory public utility undertakings as there defined and certain other undertakings defined. Section 40 has itself no reference to the goods of the undertakings in question, but goods of statutory public utility undertakings, though not of the other undertakings to which the section applies, were, in view of the projected form of the new legislation, exempted from compulsory insurance under Part II of the Act, and the undertakers were advised to defer voluntary insurance.

The Memorandum goes on to explain that Section 40 was enacted at a time when not only the nature of the modifications that would be required in the principal Act but also the precise field over which they would have to be applied was known to require further study. All that could be said at that stage was that the undertakings to which the Act could not be applied without modification would probably be found within the general field indicated by Section 40. As a result of further study the conclusion reached is that the undertakings to which Section 40 applies or may apply fall into three groups: (*a*) public utility undertakings, for which somewhat far-reaching modifications will be necessary; (*b*) "extensive undertakings," for which relatively minor modifications will be required; and (*c*) other undertakings to which the principal Act can be applied without modifications. In these circumstances it is proposed that the new legislation should begin by repealing Section 40 of the principal Act. It would then proceed to provide for precise definition of the undertakings to be dealt with as public utility undertakings, "extensive undertakings," and undertakings which fall within neither definition.

The Gas Group would include, in addition to statutory gas undertakings, any non-statutory gas undertaking carried on by a person whose sole or principal business it is to carry on such an undertaking. There may also be one or two exceptional cases of undertakings which do not satisfy either of the conditions mentioned, but which should none the less be treated as public utility undertakings—*e.g.*, the non-statutory gas undertaking carried on at Letchworth by the First Garden City, Ltd.

Personal

Mr. WILLIAM T. GILCHRIST, Engineer and Manager of the West Wemyss Gas-Works, has been appointed to a similar position with the Inverurie Gas Company. He was formerly employed with the Tranent and Prestonpans Gas Companies.

* * *

Major ALAN MONCRIEFF, O.B.E., M.C., has been appointed General Manager of the Ironworks Branch of Messrs. Newton Chambers & Co., Ltd., in succession to Major W. T. Kitching, now Chief Engineer of the Appleby-Frodingham Works of United Steel Companies, Ltd. Mr. GEORGE GILBERT IBBOTSON, General Works Superintendent of the Ironworks Branch, has been promoted Assistant General Manager (Works).

Obituary

L. J. Langford

The death occurred on Nov. 10 of LEONARD JAMES LANGFORD, Engineer and General Manager of the Tunbridge Wells Gas Company. Born and educated at Bath, Mr. Langford received his technical training in gas engineering at the gas-works there. In 1902 he was appointed assistant to his father, who was then Engineer and Manager of the Longton Corporation Gas and Electricity Works. Six years later, in 1908, he was appointed Gas Engineer to the Abertillery U.D.C., and 1915 he left to take up the post of Chief Gas Engineer to the Stoke-on-Trent Corporation. He was appointed Engineer to the Tunbridge Wells Company in 1917. Deceased was President of the Southern Association of Gas Engineers and Managers in 1924, and served on the Council of The Institution of Gas Engineers during 1923–28 and 1929–32.

This bare recital of a gas engineering career of no mean order can convey no sense of the personal loss which Leonard Langford's death will mean to a host of friends—for if any man ever gave and received friendship wherever he went it was he. In Tunbridge Wells he was indeed the "father" of his men, and he was the mainstay of a long list of local activities, especially those connected with sport and the games he had played so hard in his younger days. He was elected to the Town Council in 1937. In the Gas Industry he was too widely known and loved to need any eulogy by ourselves. We and many, however, fully endorse the tribute to his memory paid in the following lines by the President of the Southern Association, which so happily express the affection in which he was held.

A memorial service was held on Monday at Holy Trinity Church, Tunbridge Wells. It is suggested that a donation to the Institution Benevolent Fund would be an appropriate expression of personal respect. Like all other causes which might help his fellow man, it was one which Leonard Langford had very much at heart.

An Appreciation

The passing of Leonard Langford will be mourned by a wide circle of friends, for in him we have lost an esteemed colleague who embodied many enviable qualities and possessed a character of unusual charm.

He gave enthusiastic and unstinted support to the Southern Association of Gas Engineers, of which he was a past-President, and took an active part in promoting any interest which would advance the Industry which he served so faithfully and so well.

In Tunbridge Wells he was not only a respected and valuable member of the Town Council, but enjoyed a degree of popularity which is given to few to attain. Positively incapable of a mean or harsh act, he was loved by his staff and workmen, and did not spare himself in any endeavour which would promote their welfare or increase the efficiency of his Undertaking. Even during the last few tragic months when the menacing shadow (of which he was well aware) lengthened before him he regularly attended Home Guard parades.

Some years ago, as the result of an accident, he sustained severe fractures of both legs, which handicapped him for the rest of his life. It was in circumstances such as these that his dauntless courage reached its zenith. No complaint ever escaped his lips, but he faced life squarely and carried on when other and lesser men would have given up.

Some of our happiest memories will be centred round his activities for the S.A.G.M. Golfing Society, of which he was the mainstay and pillar for so many years. A meeting in happier times without his jovial and exuberant presence will be almost unthinkable. Those who had the privilege (and they were many) of entering his domestic circle at "Brookside" will recall his generous hospitality and will carry with them memories of a home life which was richly blessed.

Possessing a ready wit and unfailing sense of humour, which sustained him to the very end, he would wish for no better epitaph than that of Abou Ben Adhem—"Write me as one that loved his fellow men."

G. LE B. D.

Letter to the Editor

The Small Coke Boiler

DEAR SIR,—Conclusion No. 7 of the I.G.E. Committee on Coke Quality is "that it would be advantageous in small domestic hot-water supply boilers, if the minimum fuel capacity could be increased." This advantage can readily and economically be gained for all existing boilers if a coke bucket be put upon the market which will register with the coke inlet of the boiler. Thus all coke would not only be fed to the fire in a more cleanly manner, but the full bucket would gradually empty as the fire burned low, and thus kill two birds with one stone—(*a*) increase the coke storage and permit the fire to burn throughout the night without clinker, and (*b*) reduce dust, dirt, and maintenance.

I submit that the Gas Industry should put such on the market at the earliest opportunity, and thereby, at no cost to itself, increase the efficiency in fuel of the millions of existing coke-fired boilers.

43, Uxbridge Road,
Hampton.
Nov. 9, 1942.

Yours faithfully,
H. J. TOOGOOD.

WORKING OF THE WESTVERTICAL SYSTEM*

By GENERAL MANAGER AND CHIEF ENGINEER

IN the spring of 1934 the Directors of my Company decided to increase the carbonizing capacity of one of our works. It was decided to install a plant with a minimum capacity of at least 3 million cu.ft. per day with individual units not exceeding 200,000 cu.ft. per day. It was intended to direct the output of gas into a common distribution system then served by three installations of horizontal retorts with water-gas plants, and it was desirable to avoid any variations which might disturb the more delicately-adjusted industrial apparatus. The characteristics of the coke were of special concern, for they should not differ materially from those of the coke already being sold by the undertaking, since no facilities existed for keeping the different kinds separate.

During the spring and summer of 1934 processes typical of modern high temperature practices, including coke ovens, were visited in various parts of this country and abroad, and our attention was drawn by West's Gas Improvement Company to a new process they had installed in Holland. Messrs. West's tender and guarantees for an installation of their Westvertical carbonizing chambers were accepted finally in November, 1934, and work was commenced on the site during December of that year.

The installation consists of 24 Westvertical chambers, measuring 110 in. by 10 in. at the top by 25 ft. high from the girder floor level to the brickwork below the top casting. The bench comprises six distinct and separate settings, each containing four chambers. The whole of this plant was designed to serve a future extension of the carbonizing installation.

At each end of the bench a battery of three step-grate producers is provided, each producer being fitted with the necessary equipment for burning coke and de-dusted coke breeze. All the producers are arranged to direct the fuel gas into a common main extending for the full length of the outside of the settings, so that any of the producers is able to supply fuel gas to the chambers. By this arrangement it is possible to maintain a reasonably constant quality of fuel gas during clinkering operations. The producers are of such a capacity that five of them are sufficient to heat the complete bench of six settings, and any one of them may be shut down for re-lining without affecting the output of the installation.

A large number of 24-hour samples of the producer gas used for heating the settings has been tested. The average of these results is given, and it is noteworthy that the variation of carbon monoxide content from the average figure was only 1.3%. Spot tests have given similar results.

CO_2	4.5%
CO	28.2%
H_2, &c. (by difference)	10.8%
N_2	56.5%

Approximate calorific value 125 B.Th.U. per cu.ft.

The producers are clinkered every 24 hours. There is little variation in the quality during periods of clinkering.

The waste-heat recovery plant consists of two waste-heat boilers of the Spencer-Bonecourt fire-tube induced-draught type, each capable of raising 18,000 lb. of steam per hour from and at 212°F. and designed for a working pressure of 120 lb. per sq. in. Each boiler is capable of dealing with the whole of the waste gases from the six settings when all the chambers are in full operation.

During the six months' period in 1939 (see Table II) the water supplied to the boilers was equivalent to 1,605 lb. per ton of coal carbonized or 4.25 lb. per lb. of fuel fed to the producers. It is estimated that approximately 60% of the steam raised in the waste-heat boilers is required for steaming the chambers, for pumping liquor to the collecting mains, for the steam supplies to the producers, and the power requirements of the plant. A surplus of 40% is therefore available for other works purposes.

An intermittent system of carbonizing imposes considerable demands upon the governor, and in this process they are very heavy, as the chambers are not isolated from the foul main during the charging and discharging operation. Although the hourly variation in the quantity of gas evolved from a single chamber is not more than + or − 10%, the rapid admission of 3 tons of coal tends momentarily to throw a heavy back pressure through the installation. The gas pressure on the installation is controlled by a Bryan-Donkin retort-house governor.

Operation of the System

The carbonizing unit is completely enclosed, from the gas-tight coal valve at the top to the discharging door at the bottom, and these are opened only at the end of the carbonizing period to admit coal to the chamber and to take cooled coke away from it. Dust and smoke incidental to these operations are reduced to a minimum, and there is no emission of steam and fliers or great loss of heat while discharging the coke. The system therefore meets the requirement that it should not have any detrimental effect on the amenities and cleanliness of the surrounding property.

The unit may be regarded as divided into three zones (see accompanying diagram, figs. 1–6). The lowest or cooling zone extends from the discharging door upward through a bricklined cooling chamber. Above this lies a comparatively short zone extending through the two bottom combustion chambers of the setting, which is known as the conversion zone, since there the coke is maintained at a temperature sufficient for the water gas reaction. The uppermost zone is the carbonizing zone, in which the distillation of the new charge takes place.

At the end of the carbonizing period the cut-off at the top of the discharging chamber is closed and the discharging door at the bottom is opened, both operated mechanically, and the contents of the discharging chamber pass to the coke conveyor. The discharging door is then closed and the cut-off opened, allowing the charge to drop into the discharging chamber. This process is immediately repeated, leaving the two lower zones filled with hot coke and the carbonizing zone ready to receive the new charge. The coal valve is opened and the coal flows through the feeding "box" until the top of the charge is within a predetermined distance of the top of the mouthpiece. The coal valve is closed and the carbonizing period begins. All these operations are carried out within a very few minutes.

One of the features of this system which appealed to us was the fact that the coke is cooled before being discharged. A normal discharge consists of two increments of about one ton each. The first of these is contained in the discharging chamber below the cut-off plate and the second above the level of the cut-off plate. The coke is discharged at a temperature of about 300°C.

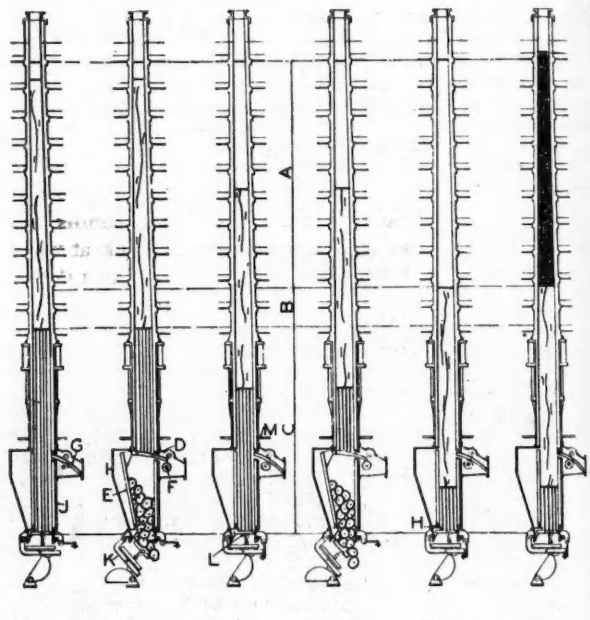

FIG 1. FIG. 2. FIG. 3. FIG. 4. FIG. 5. FIG. 6.

A. *Carbonization Zone.*
B. *Intermediate Zone.*
C. *Cooling Zone.*
D. *Cut Off Valve.*
E. *Hinged Wall.*
F. *Pinion.*
G. *Rack.*
H. *Hinge.*
I. *Fixed Casing.*
J. *Fixed Casing.*
K. *Discharge Door.*
L. *Protector Plate.*
M. *Steam Pipe.*

FIG. 1.—*The state of the charge after carbonization and immediately prior to discharge.*

FIG. 2.—*Coke in cooling chamber cut off for the first time and coke discharged.*

FIG. 3.—*Cut off plate opened and carbonized charge dropped for the first time.*

FIG. 4.—*Coke in cooling chamber cut off for the second time and coke discharged.*

FIG. 5.—*Cut off plate opened and carbonized charge dropped for second time.*

FIG. 6.—*Chamber recharged and the previously-carbonized charge ready for steaming.*

* From a Paper to the Eastern Counties Gas Engineers' and Managers' Association, Nov. 13.

Steam is admitted continuously at two points, one at the base of the cooling chamber and one above the cut-off. It is superheated as it passes through the initially hot coke, and above this in the zone of higher temperature, the production of water-gas commences. Thus the production of water-gas is continuous, and for the first few hours after charging considerable advantage is derived from the heat of the coke in the cooling chamber.

Although the plant was purchased with a rated capacity based on a 7% scurfing allowance, we were disappointed to find that in practice the time absorbed by the complete scurfing operation reduced the capacity by at least 10%. The original method was to admit air and steam through the discharging door and allow the scurf to burn off from the bottom upwards. This process removed the scurf from the lower portions of the retort in a reasonable time, but the removal of scurf from the upper end was slow and unsatisfactory. We persevered with this method for several months, but in March, 1939, we adopted a different procedure, which we have retained ever since. After the chamber has been scurfing about ten hours with the admission of air and steam at the bottom, the bottom doors are closed, the steam is shut off, and air is caused to circulate in the chamber from the top. This has been the most important factor in the achievement of a satisfactory solution to the problem of reduced output through scurfing.

It is now possible to operate the plant with a scurfing allowance of not more than 6.5% of the rated capacity, though since the war began it has been necessary to extend this period slightly to avoid the risk of flare during the hours of blackout. The carbonizing cycle has been varied from seven hours to twelve hours, and under these conditions the chambers have been taken off for scurfing after from thirty to fifty charges have been passed through. Generally speaking, under all conditions it has been found most satisfactory to scurf the chambers after thirty-five charges have been carbonized. When a chamber is taken off adjustments are made so that combustion chamber temperatures are maintained as nearly as possible at their carbonizing level. The temperature of the interior walls of the chamber is regulated by adjusting the air and steam admitted at the bottom in the early stages, and by controlling the air circulation in the chamber from the top during the later stages of the scurfing process it is possible to maintain the temperature of the chambers at a fairly constant level.

Characteristics of Gas

An average analysis of the gas made in the chambers is given in Table II of summarized results of the six months' working in 1939.

It is now the practice to limit the amount of steam to 10% by weight of the coal carbonized, and this steam is added continuously at a steady rate throughout the carbonizing period.

The H_2S content of the gas is higher than that produced from similar coals in the horizontal retorts. During 1938 the average figure for tests made on the intlet to the purifiers was 568 grains per 100 cu.ft. The average figure at two of our other works, where there are horizontal retorts, was 500 grains. It is interesting to note that in 1937, when 20% or more of steam was added, the H_2S content of the gas was higher, the average figure for 1937 being 605 grains per 100 cu.ft.

The figures for organic sulphur compounds in the gas are not very different from those obtained at the other stations. The average of the large number of tests at our other works is 24 grains per 100 cu.ft. at the inlet to the benzole plants. At this works the average was 21.6 grains per 100 cu.ft., and this was reduced to 13.6 grains in the benzole extraction plant.

The process is highly flexible where it is desired to regulate the calorific value of the finished gas by control in the retort house.

TABLE I.

Year	1936.	1937.	1938.	1939.
Period covered by Results	11 months	8 months		6 months
Coal carbonized	Yorkshire	Yorkshire		Yorkshire
Carbonizing period (hours)	8	8 & 9		10
Steam to chambers, Percentage of coal carbonized	22½	18		10
Gas therms per ton at 30 in. Hg and 60° F.	85.00	87.01		80.53
Benzole. Gallons per ton	1.18	0.71		3.04
,, Therms per ton	1.77	1.07		4.56
Total therms per ton	86.77	88.08		85.09
Tar. Gallons per ton	13.75	13.75		12.65
Specific Gravity of Tar	1.128	1.128		1.142
Coke and Breeze, *ex* retort house, cwts. per ton	9.05	9.42		10.38
Average number of settings under fire during period	4.7	4.9		6.0

No period when chambers worked alone

TABLE Ia.—Characteristics of Tar.

Distillation of Tar.		Specific gravity of Tar and fractions at 15.5°C.	
Moisture	2.5% by weight	Tar	1.142
Oils to 200°C.	4.4 ,,	Oils to 200°C.	0.991
200–230°C.	4.2 ,,	200–230°C.	0.991
230–270°C.	8.2 ,,	230–270°C.	1.018
270–300°C.	6.4 ,,	270–300°C.	1.020
300–350°C.	13.5 ,,	200–350°C.	1.065
Pitch at 350°C.	63.5 ,,		

Free Carbon on dry basis	5.5% by weight.
Crude Tar Acids in oils	200–270° 35.6% by volume.
Tar Acids, calculated to Dry Tar	4.4%
Naphthalene	Trace.

TABLE II.—Period Covered—March to August, 1939.

Coal carbonized (tons)	29,474
Total gas made for distribution* (cu.ft.)	474,995,000
Average calorific value of gas sent out. B.Th.U./cu.ft.	502
Total therms of gas sent out	2,384,705
Producer gas added as diluent (cu.ft.)	8,867,000
Therms of producer gas added at 125 B.Th.U./cu.ft.	11,083
Therms of coal gas sent out	2,373,622
Therms of coal gas per ton of coal (stripped)	80.53
Crude benzole made, less fresh oil added to the benzole washer (gallons)	89,580
Gallons of crude benzole extracted per ton of coal carbonized	3.04
Therms of benzole extracted per ton of coal calculated on basis of 1.5 therms per gallon	4.56
Total gaseous and benzole therms per ton of coal carbonized in chamber house	85.09
Therms of producer gas added as diluent per ton of coal	0.38
Total gaseous therms distributed (including benzole therms) per ton of coal	85.47
Average weight of charge	3.28 tons
Period of carbonization	10 hours
Quantity of steam supplied to chambers	10% approximately
Average calorific value of gas from chamber house during 6 months	543 B.Th.U.
Fuel consumption	16.2 lb. of dry fuel per 100 lb. coal carbonized

Note.—All gas volumes are corrected to 30 in. Hg and 60°F. The calorific value shown above for the gas made for distribution is the average from the Gas Referee's Official Fairweather recorder. This recorder is also verified every morning by the Company's staff.

Average Proximate Analysis of Coal Carbonized.		*Average Gas Analysis.*	
Volatile matter	35.0%	Carbon dioxide	3.5%
Ash	4.1%	Oxygen	0.4%
Moisture	3.8%	Unsaturated hydrocarbons	3.2%
		Carbon monoxide	12.7%
		Methane	24.9%
		Hydrogen	53.0%
		Nitrogen	2.3%
		Specific Gravity	0.43

TABLE III.—Summary of Repair and Maintenance Costs Over 6½ Years.

312,000 tons of Coal. Total Yield 85 therms per ton.

	Materials. £	Labour. £	Materials. Pence per ton of coal.	Labour.	Total.	Total Pence per Therm.
Bottom Ironwork, Operating Mechanism, Discharging Doors and Cooling Chambers	1,318	4,690	1.013	3.607	4.620	0.054
Mouthpieces, Ascension Pipes, Mains, &c.	726	2,135	0.558	1.642	2.200	0.026
Coal Handling Plant (including in coal breaker)	62	55	0.048	0.042	0.090	0.001
Band Conveyors (including chutes, &c., to L.B. Conveyors)	115	94	0.089	0.072	0.161	0.002
Producers (including coke chutes and skip, &c.)	464	128	0.357	0.099	0.456	0.005
Electrical Plant	436	338	0.336	0.260	0.596	0.007
Lip Bucket Conveyors (handling coal and coke and clinker to and from the plant and coal into stock)	*2,805	*1,090	*2.158	*0.838	*2.996	*0.035
Sundry materials not dissected. Lubricants, Tools, Fittings, Brushes, Paint, &c.	1,078	—	0.828	—	0.828	0.010
	7,004	8,530	5.387	6.560	11.947	0.140
Chamber repairs and resetting	16,441				12.650	0.149
					24.597	0.289

N.B.—*These figures should not be considered apart from the text.

TABLE IV.—Costs of Manufacture Based Upon Wages and Prices of Materials in 1939, and a Yield of 80.53 Therms of Gas per Ton of Coal.

		Pence per Therm.
Coal, including handling charges at 32/6d. per ton		4.842
Residuals—		
Coke, 9.11 cwt. at 32/5d. per ton	2.200	
Breeze, 1.27 cwt. at 5/2d. per ton	0.048	
Benzole, 3.04 gall. at 11.1d.	0.419	
Tar, 12.65 gall. at 1.9d.	0.297	
Concentrated ammoniacal liquor	0.017	
Steam, surplus to all chamber house requirements, 640 lb. per ton at 1/6d. per 1,000	0.143	3.124
Net cost of raw materials		1.718
Process labour, based on 1,176 tons of coal per week		0.146
Repair and maintenance (over 6½ years)		0.305
Capital Charges—		
At 9% on £80,000 to cover interest, amortization and insurance		0.345
		2.514

Coke

The coke is consistently of a light grey colour, strong in texture, and uniform throughout. The volatile content averages 2.5% and the moisture 0.7% as discharged to the belt conveyor. In a standard grate designed for coke burning it will ignite in 15 minutes—that is, in appreciably less time than is required for our horizontal coke. It is rather more difficult to ignite than continuous vertical retort coke, but as it lasts longer it is eminently suitable for enclosed boilers. As an experiment for a period only Westvertical coke was supplied to a

number of consumers, and it is remarkable that though none reported any improvement on the fuel previously received, when these consumers were again served with horizontal coke we had many complaints. These broadly stated that the coke required longer to ignite and was generally more troublesome than the earlier consignment. The grading arrangements do not permit the two cokes to be marketed separately, but we endeavour to maintain a fairly constant mixture, which we have every reason to believe satisfies our customers.

The characteristics of the tar lie between those of tars produced in horizontal and continuous vertical retorts, and an analysis is given in Table IA.

Labour

An experienced bricklayer supervises the detailed operation of the plant and, with an assistant, regulates the heats and cleans the flues.

Three stokers are employed each shift. These men charge and discharge the chambers, clinker each producer once in twenty-four hours, and operate the conveyors.

One scurfer is engaged on day work and, in addition to the scurfing duties, flushes the collecting mains and cleans the seal pot.

During the day a greaser attends to the lubrication of the extractor mechanism, pumps and conveyors, and a general labourer assists with the sweeping and cleaning of the plant.

This gives a total of fourteen men to produce 3 million cu.ft. of gas per day, equivalent to 4.66 men per million.

Since the war, owing to difficulties in operating under blackout conditions, two additional stokers have been introduced, giving an equivalent figure of 5.33 men per million.

Coal unloading occupies about 40 man hours of labour per week, in addition to the labour already detailed.

Results

Since the plant was installed it has carbonized approximately 312,000 tons of coal, and during the war this has included a large percentage of unscreened Durham coals and Yorkshire coals of a lower quality than those formerly purchased.

During 1936 and 1937 higher proportions of steam were admitted to the chambers than in 1939. Prior to 1938 the recovery of benzole was only incidental to the process of naphthalene extraction, but in more recent years about 4.5 therms per ton of coal carbonized have been extracted as benzole.

The results shown in Table I are taken from the carbonizing journal, and cover only those periods when the plant was working alone, so that no estimates of gas made either in the horizontal retorts or water-gas plants are involved. I would like to stress that the results are in every respect typical of day-to-day working. None of the figures given in this Paper has been obtained under "test conditions," and throughout the periods under review only the normal supervision was employed on the works.

Unfortunately, it is not possible to show how far the installation has been responsible for the reduction in gas-making costs at the station, as the gas from the plant is not separately metered, and for appreciable periods each year the plant has been operated in conjunction with horizontal retorts and water-gas plants.

Table IV shows manufacturing costs based on the prices of raw materials and products, and labour rates prevailing in 1939. The carbonizing wages are calculated on a conservative basis, as no additional labour is employed when the plant is operated at its maximum capacity.

It will be observed that the maintenance of the cross lip-bucket conveyors is very heavy, but in addition to the coal and coke required for the routine operation of the house, they handle the ashes and all coal put into stock. In regard to maintenance, it is estimated that the gross tonnage of all materials handled by the cross-lip bucket conveyors is nearly two-and-a-half times the tonnage of coal carbonized up to date. I wish to make this quite clear, because, following the policy I have adopted in building up the information for this Paper, the whole cost of upkeep of the conveyors is included, and it is calculated on the basis of coal carbonized and per therm of gas made. Probably it will be held by some that only a portion of this cost should be debited to the carbonizing process, and I am inclined to agree, but such a division of costs is not easy to make, and in any case could only be an arbitrary apportionment.

On a ten-hour carbonizing cycle with Yorkshire coals containing 6½% moisture and ash it was anticipated that the cost would be 2.64d. per therm. Substantial charges for the new ascension pipes with gas valves and many other items which might be regarded as improvements have been included in the maintenance costs. However, such items should not recur, and I look forward with confidence to a considerable reduction in the maintenance figures in the future.

Conclusion

Summarizing our six-and-a-half years' experience with this installation, I should say that the yields of products per ton of coal carbonized have consistently fulfilled our expectations. The operating costs are within our estimates, but the maintenance charges have been higher than we anticipated, though these are inflated by charges inseparable from the development of a new system.

It may be said that the staff and employees of the company who have been connected with this plant have had a unique experience, and I feel sure the Contractors, Messrs. West's, and particularly Mr. Ernest West, who was responsible for the design, would admit, unhesitatingly, that the difficulties in the early days could not have been overcome and the measure of success we have so far enjoyed could not have been attained, without the whole-hearted co-operation of every employee. I should also like to record my own appreciation of the generous co-operation and goodwill which Messrs West's and their technical staff evinced throughout the period of the contract, which has been sustained ever since. The Industry owes much to the constructors of gas plant, and I think it can be claimed justifiably that the development of this plant is an excellent example of the goodwill which exists between the Industry and Plant Constructors.

As the older systems of carbonizing have had their difficulties, so this new development in carbonization has brought its peculiar problems, some of which have only become apparent and shown their full significance after an extended period of operation. I feel confident that the knowledge and experience which have been accumulated will ensure that the future designs incorporate improvements to a system which, I believe, will ultimately become an established method of carbonizing on works producing up to 10 million therms per year.

Discussion

Mr. F. H. Robinson, remarking that carbonization was the core of the gas-making process and that obviously the Paper they had had was of first interest to them all, asked whether the Author had experienced any difficulty in balancing the producer gas, seeing that the producers were at both ends of the setting. Also, what were the carbonizing temperatures on the 10-hour charging cycle adopted? The Author's plant appeared to give results midway between those of continuous vertical plant and intermittent vertical plant. The system could be described as a half-way house giving the advantages of intermittent working together with the discharge of cooled coke.

A Member explained his particular interest in the Paper in that when his undertaking was contemplating the installation of new carbonizing plant, considerations of local amenities, freedom from dust, good working conditions, coke characteristics, flexibility of gas quality, and high thermal yields resulted in the final selection of the Woodall-Duckham static vertical retort, an installation of which had been put into operation over 2½ years ago. In the static vertical retort, the speaker continued, the basic principles of carbonization were similar to the plant described by the Author, but the design was markedly different. His (the speaker's) static vertical plant had not run long enough for them to be able to forecast the cycle of repairs; when it had run sufficiently long for information to be collected comparable to that given in the Paper he hoped to publish the results.

Now the Paper under discussion established that a high thermal yield of gas per ton of coal was obtained on the Westvertical system, yet, even on a carefully designed plant it was impossible to get something for nothing, and it seemed that high thermal yield was being accompanied by increased maintenance cost. The essential feature of this type of process was to superimpose a carbonizing chamber on a cooling chamber. Each held a complete charge. It was not surprising therefore that the maintenance cost per ton of coal carbonized was higher than on a continuous vertical retort. Whether the final overall cost per therm of gas made would be higher was another matter. It depended on the relative values of gas and coke.

The loss due to scurfing—6½%—had impressed him. With the W-D plant the figure was less than half, and they were able to run at least 80 charges before scurfing. However, his own gasmaking results confirmed the Author's figures. The Author had referred to the characteristics of the tars produced lying between those of tars produced in horizontal and in continuous vertical retorts. At the present time this had an important corollary—the production of benzole and toluole of satisfactory quality and quantity. With the speaker's plant no difficulty had been experienced in producing an excellent road tar, which conformed in every respect to the recent draft specification submitted by the B.R.T.A. to the British Standards Institution.

Finally, he would ask the Author one or two questions. Presumably his retorts had an increasing taper from top to bottom in their minor axis. When fresh coal was introduced on to the lowered coke charge, was there any tendency for coal to percolate into the cooling chamber? In his own plant he "capped-off" the lowered charge with a pad of coke before introducing the new coal. Was the tendency for "hangers" in the Author's plant associated with percolation of coal into the lowered hot coke? In view of the shattering effect on the coke block due to dropping the charge, it would have been interesting if the Author could have given a screening analysis of his coke as discharged from the retort.

Dealing with brickwork maintenance, one could understand and could confirm the more rapid deterioration of the retort brickwork in the zone of maximum ash liberation consequent upon water gas production, but it was difficult to see why this should affect the whole retort. On the retorts that have been reset recently, was it the Author's view that "local" repairs only would be required for some time? During the 1940 rebuilding of the chambers, solid bricks were substituted for the panelled tiles. Was this found to increase the fuel

consumption? Alternatively, had the use of solid bricks materially affected the rate of heat transfer to the charge to the extent of necessitating higher flue temperatures or increasing the carbonizing period?

One of the basic claims for the type of carbonizing process described was that high therms per ton followed the steaming of the hot coke in the cooling zone and intermediate zone. Reduction of calorific value by producer gas dilution must take away some of the advantages. Now that the Author had his settings rebuilt, was it his intention to continue steaming only to, say, 540 B.Th.U.? In other words, was his view that the extra maintenance cost incurred by steaming down his gas to give him his required declared calorific value after benzole washing outweighed the advantage of the extra therms per ton he would obtain? If this was so, was this a function of his particular coal ash, combustion chamber temperatures, refractories, or what? If flexibility in calorific value had to be "written off," it reduced one of the advantages of the system.

An Engineer and General Manager who also had a W-D static vertical plant spoke of his experiences. The essential differences between the W-D plant and the Westvertical were, he suggested, first the arrangements for charging the coal to the retorts; secondly the method of coke discharge; thirdly the system of gas offtakes. With his W-D plant charging was by a travelling car. The Author's plant had a hopper feed comparable with that normally associated with continuous vertical retorts. Did the Author find a free space on each side of the retort's major axis, and did he find stickiness of the coal in the feeding hopper? With his (the speaker's) plant, the coke extraction gear could regulate the quantity of coke discharged, but apparently with the Author's plant all the coke below the cut-off valve had to be discharged. How would the coals charged affect the coke and the breaking-up of the charge? Regarding the gas offtakes, the W-D plant had water-sealed valves and each retort could be isolated. It seemed that the Author worked with an open foul main, which perhaps was asking for air infiltration. Now, as to the degree of steaming. The Author steamed to 10%, presumably to avoid the erosion of silica, but he (the speaker) was doubtful if this quantity of steam was sufficient to cool the coke adequately, and he would welcome information from the Author on the renewal of the refractory lining of the cooling chambers. As to cost figures, the capital costs of the W-D and the Westvertical systems showed approximate similarity, labour costs were about the same, and he hoped that with his W-D system maintenance costs would be lower. There was, however, a striking difference between the net cost of materials. The Author's figure was 1.718d. per therm; his own figure was 0.93d. per therm. He would add that he was working on Durham coals, whereas the Author was carbonizing Yorkshire.

An Engineer from an undertaking operating a small Westvertical installation then related his experiences. His installation consisted of four chambers; consequently the heat losses were heavier than with the plant described by the Author, which consisted of 24 chambers in double row. Now with his own installation he had suggested to the contractors that an "umbrella" type of roof would prove satisfactory. In the event, however, it proved nothing of the kind, and they were now totally enclosing their plant. Effect of exposure to the wind was that steam rapidly condensed in the coke-cooling chamber and set up serious corrosion—so serious that new chambers were found necessary. With the enclosing of the plant he did not anticipate further trouble of the kind, though as regards heat losses it should be borne in mind that his final installation would consist of six chambers in line as distinct from the two rows of 12. His own small plant incorporated a coal-charging car fed from a hopper. The retorts were charged through one rectangular opening, and he was satisfied with this arrangement. He certainly preferred it to individual coal hopper feeding each retort. The single coal hopper he had mentioned was fed by skip hoist; the hoist was cheap in first cost and economical to maintain.

The Assistant of the previous speaker gave further details concerning the operation of the foregoing Westvertical plant. He first wondered why the Author found it necessary to scurf the retorts after 35 charges, which represented 6.5% loss on retort capacity. In his experience he had found it convenient to run 60–65 charges in between scurfing, which represented a retort capacity loss not exceeding 5%, and on occasion they had run up to 100 and 105 charges—that was on a 10-hour charging cycle. He queried what the Author's carbonizing temperatures were, and whether these had any influence on the amount of scurf formed. He (the speaker) ran at 1,300°C. at the bottom combustion chambers down to 1,020°C. at the top circulating flue. Perhaps a higher scurfing temperature was needed in his case, but it was generally agreed that the erosion of the brickwork in the lower portion of the retort was much in excess of any damage likely to be caused by a higher temperature in burning off the scurf found at the top. Regarding the relative merits of tar and liquor circulation, the Author, while not condemning tar circulation, appeared to favour liquor circulation. He (the speaker) had found tar circulation thoroughly satisfactory. It was only a question of ensuring continual addition of fresh tar from the storage well and regular attention to collecting main and seal pot. What factors, he wondered, had caused the Author to change over from tar to liquor circulation?

He then came to the question of the content of sulphuretted hydrogen in the crude gas. Compared with horizontal retort practice the Author had found an increase in H_2S with the Westvertical installation. His own experience had been the reverse. In fact, the average sulphur content at inlet to purifiers had been reduced by 50 grains working on Westverticals and horizontals mixed as compared with horizontals alone. Organic sulphur compounds were slightly lower than with horizontals.

The speaker finally mentioned the matter of sealing the bottom doors, saying that after considerable trials with different types of timber he had found hemlock strips the most satisfactory.

Mr. **E. V. Evans** (Institution President), called upon to speak, remarked that he had been in the Industry for some years, and that when he first entered the Industry contractors of plant were—well, they were contractors, and they had to be careful. Now the position was entirely transformed. The contractors had become more and more efficient, and it was a pleasure to work with them. On the other hand, gas engineers who had to operate plant had become more and more dependent on them, and maybe it was fitting in these days of efficient contracting to breathe a warning concerning overmuch reliance, for gas engineers should know their plant intimately, and as a corollary how to operate it to give the best results. Ultimate success depended on operational ability, however excellent the design of plant.

Mr. **W. J. C. Garrard** (Ipswich) put forward several questions. He wondered why the Author worked with a small percentage of carbon monoxide in the waste gases from his setting. With such working was not there a tendency to waste fuel? Again, what type of apparatus did the Author employ for gas analysis? Then there was the figure of 2½% quoted for the volatile matter of the coke. Did this include the 0.7% of moisture also quoted? Was the 9 cwt. of coke given as "coke sold" *ex* retort house or actually sold over the works weighbridge. He noted that the calorific value of the gas made in the retorts varied from 700 B.Th.U. to about 320 B.Th.U. How did this affect the constancy of calorific value of the gas distributed to the district?

Mr. **H. J. Toogood,** remarking on the corrosion due to condensation of the steam, suggested that it might prove beneficial to employ superheated steam. Regarding the plant broadly, he thought that its future success would depend upon its ability to carbonize coals which were cheaper than those which could be carbonized in continuous vertical retorts.

Mr. **Ernest West** said that primarily the Westvertical system, in the development of which he had been partly instrumental, was envisaged from the angle of producing a dense coke, and at the same time embodying the advantages of continuous carbonization and continuous water gas production. Experimentally and on a comparatively small scale it was not, of course, possible to visualize and assess the difficulties which might arise on large-scale working, and he expressed his thanks to the Author, who had launched forth on a large plant and had given them the benefit of learning of its results. It was an example of co-operation which he greatly appreciated.

The General Manager and Chief Engineer who was responsible for the Paper replied. In the first place he said that the balancing of producer gas in the common main presented no difficulty whatever in practice. Frequently there were three producers in operation at one end of the setting and two at the other end, and they balanced pressures to 3 or 4 hundredths of an inch and experienced no difficulty in maintaining steady conditions. Regarding carbonizing temperatures, there were five combustion chambers at the lower end of the retort and these were kept at a temperature of 1,200°–1,350°C.; the top circulating flues had a temperature of 900°–1,000°C. The sixth flue, he would mention, could be used as either a combustion or a circulating flue. He agreed that the plant appeared to fall midway between the continuous and intermittent systems. The retort chambers tapered from 110 in. by 10 in. to 116 in. by 16 in. on major and minor axes respectively. As to the heat transfer with solid bricks, it had not been found necessary to raise the temperatures in the combustion flues, but he would remark that they were not on a "rapid" schedule of carbonization. In the matter of the coal charge slipping into the coke, they did not adopt a coke pad; they relied on the dropping of the coke into the cooling chamber to break the upper crust and split it along its major axis. A little coal might drop, but it was fully carbonized in the interval between the next discharge of coke. For some time they had been operating the plant to give a gas of a calorific value of from 530 to 550 B.Th.U. Benzole was needed and coke was bringing in appropriate revenue. Operating at 520 B.Th.U. the gaseous thermal yield amounted to between 90 and 95 therms per ton of coal carbonized. With lower calorific values the plant did not lose flexibility. With the reduced volume of steam there had been a marked improvement in erosion. The chamber was charged through the coal box and the gas valve was left open; normally the valve was closed only during scurfing periods. The coke-cooling chambers were lined with firebrick and the lining had not given trouble. Regarding capital charges, it was difficult without knowledge of the particular details of plant to arrive at valid comparisons, but the W-D and Westvertical systems appeared to agree closely. He did not suggest that 35 charges prior to scurfing was an optimum cycle; he himself had worked on occasion to as many as 70 charges. Concerning the circulation of tar or liquor, liquor circulation was simpler and called for less attention. He would have expected an increase in the H_2S content of the gas produced in the plant, and was surprised at the results given in the discussion by a speaker working on similar plant. Gas analysis was taken on an Orsat apparatus incorporating the Metro nitrogen equipment. Concerning the figure given for the volatile content of coke, this did not include any moisture content.

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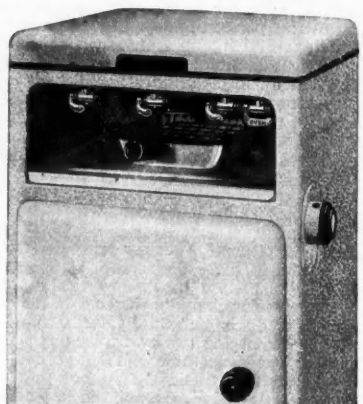

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The "coke for sale" figure was coke *ex* retort house and not coke as sold *ex* works gate. The waste gases were sampled at the combustion flues and they did contain a slight percentage of carbon monoxide, which, however, was burnt before the inlet to the boiler. The carbon dioxide content as sampled averaged 19–20%; at inlet to boiler the corresponding figure was 13–14%. It was difficult to avoid infiltration of air. It was true that the calorific value of the gas from a single retort varied from 700 to 340 B.Th.U. per cu.ft., but the charging cycle of the plant as a whole took care of this variation, and the calorific value of the gas at inlet to holders did not vary by more than ±5 B.Th.U. He had good storage capacity, and preserved a straight C.V. line of the gas going out from the works to the district. Finally, he thought that the suggestion advanced regarding the use of superheated steam would not overcome corrosion difficulties caused by condensation.

North of England Auxiliary

The first meeting of the Auxiliary Section of the North of England Gas Managers' Association since the war was held at Newcastle on Nov. 6, when there was an encouraging attendance.

The election of officers for the coming year was as follows: *Chairman*, F. Nicholls (Newcastle); *Vice-Chairman*, T. T. Tarn (Darlington); *Committee*, F. J. Webster (West Hartlepool); *Hon. Secretary*, L. M. Weldon (West Hartlepool).

Mr. Nicholls presented a Certificate to the retiring Chairman, Mr. G. J. Duncan, M.B.E., of North Shields, to commemorate his period of office, and on behalf of the members expressed appreciation of Mr. Duncan's services to the Industry and the Association.

Mr. Nicholls then gave his Address, in the course of which he said that experience of air raids had focused attention on ancillary troubles, such as flooding of mains and meters by overflow from burst water mains, damage to holders by firing of oil in cups, the need for purging apparatus to prepare damaged plant for repairs, &c. He explained that purging plant had been purchased by the Newcastle Undertaking and was available for use in the North-Eastern district.

The machine is similar in principle to that described by F. M. Birks at the Institution meeting in 1937, but embodies certain improvements. Inert gas is produced by the complete combustion of either town gas or fuel oil. Gas and air are supplied *via* Connersville blowers, which are driven from a common shaft by an engine which may be run on either petrol or town gas. Continuous indication of the CO_2 content of the inert gas is given by an indicator of the W.R. type, which operates on the reduction in pressure caused by the absorption of CO_2 from the inert gas by an absorbent cylinder. Cooling of the inert gas is very efficient, being effected by intimate content of gas and water in a tower filled with Raschig rings. It is so efficient that care must be taken to avoid flooding of the CO_2 indicator by condensation from the inert gas. After plant has been purged with inert gas the machine may be used as an air blower to clear the plant of inert gas as a prelude to entering it for the execution of repairs.

Mr. Nicholls also referred to the use of town gas and producer gas for motor transport, to complete gasification, and to education. Regarding education, he remarked that the Institution's Education Scheme did not seem too popular with the young men in the Industry. The latest report was disquieting both as to numbers sitting the examinations and the quality of the answers submitted. War conditions might be partly responsible for this state of affairs, or perhaps more encouragement was needed. From opinions he had heard not only in the North-East, but also in London, many of the young men were doubtful whether all the hard work and long hours entailed in working for the Institution Certificates were really worth while. They admitted that the possession of these Certificates was an aid when applying for appointments outside their own undertakings, but would like to feel that they were of similar advantage at home. They were of opinion that success in each of the Institution examinations should be rewarded by a definite increment of salary, and, further, that greater value should be attached to these successes when internal promotions were being made. The opinion was freely expressed that some of the Seniors who most loudly praised the Education Scheme at public meetings paid little attention to it in making their own domestic appointments.

Mr. J. R. Cleator, of South Bank, proposed a vote of thanks to the Chairman for his Address, and this was seconded by Mr. C. Stanley Read, of Washington.

Mr. Bernard Richardson, of the Newcastle and Gateshead Gas Company, then gave a Paper on "Practical Aspects of Benzole Recovery by Gas Oil."

Throughout the Summer the Bedford District Gas Company has regularly given demonstrations of all methods of fruit bottling and the preserving of fruits and vegetables. To encourage the public to interest themselves in this urgent national work, prizes were offered for the best exhibits submitted by women's organizations, by schools, and by individual housewives. More than 1,600 persons attended these demonstrations, and in addition special demonstrations were given to classes of schoolgirls. Over 2,800 enquiries have been dealt with by Miss Davis, the expert cookery demonstrator.

Eastern Counties Association

A Meeting of the Eastern Counties Gas Engineers' and Managers' Association was held in London on Nov. 13, Mr. F. H. Robinson (Bishops Stortford) presiding. Attendance figures assumed almost pre-war proportions, and among those present were the Director-General of Gas Supply (Dr. E. W. Smith) and the President of The Institution of Gas Engineers (Mr. E. V. Evans). Replying to a cordial welcome extended by the President, Mr. Evans remarked that the Industry faced immense problems; however, though from time to time it was subject to a good deal of criticism, he was confident the Industry would win through. Perhaps it had been too content and too inclined to live on its past achievements, but there were keen men in the Industry who realized the position and would improve upon it.

Prior to the business of the meeting the President referred to the death of Mr. W. J. Mason, of St. Ives, a member of the Association since 1902.

On the proposition of Mr. L. C. B. Williams (Thetford), seconded by Mr. T. V. Johns (Lowestoft), Mr. Robinson was elected District Representative on the Council of the I.G.E.

Mr. Robinson then proposed, and Mr. D. B. Parkinson seconded, that Mr. Williams be elected President of the Association for the coming year; and on the proposition of Mr. J. H. Rioch (Cambridge), seconded by Mr. F. N. Howes (Chelmsford), Mr. W. J. C. Garrard (Ipswich) was elected Vice-President.

Members of Committee elected were Messrs. F. N. Howes and D. B. Parkinson; Messrs. J. H. Troughton (Newmarket) and H. R. Wimhurst (Bury St. Edmund's) were re-elected Auditors; and Mr. H. H. Redwood (Newmarket) was re-elected Secretary and Treasurer.

A Paper was then presented by the General Manager and Chief Engineer of a Gas Undertaking somewhere in England in which he gave the results of several years' working of an installation of West-vertical retorts. An abstract of his Paper and a report of the discussion to which it gave rise will be found on p. 218 *et seq.*

Following a vote of thanks to the General Manager and Chief Engineer in question, proposed by Mr. Garrard and seconded by Mr. R. A. Weston (Norwich), Colonel J. Kennington (Grimsby) made an appeal to members to support the I.G.E. Benevolent Fund, calling attention specially to the desirability of individual support by Deed of Covenant. This brought the meeting to a close.

National Gas Council

A Meeting of the Central Executive Board of the Council was held on Nov. 10 at Gas Industry House. The Chair was taken by Sir David Milne-Watson, Bart., LL.D., D.L.

A report was received with regard to coal supplies. It was reported that a deputation from the Conjoint Conference had appeared before the Minister of Fuel and Power on Oct. 23. The deputation was introduced by Sir Herbert Williams, M.P., and consisted of representatives of gas, water, and electricity. The main questions dealt with were: (1) The necessity of consultation with consumers on questions of price. (2) The settlement of individual disputes as to quality and price. (3) Price of outcrop coal. The Minister promised to communicate with the Conference in writing with regard to the discussion.

Mr. E. V. Evans, Vice-Chairman of the National Gas and Electricity Committee, reported the progress made by the Sub-Committee that was obtaining evidence showing the success of the Fuel Economy Campaign.

A letter dated Oct. 21 from the Gas and Electricity Division of the Ministry of Fuel and Power was reported, announcing the appointment of a small Committee to consider general efficiency in gas-works. It was agreed that this matter should be dealt with by The Institution of Gas Engineers.

Attention was drawn to the statement made in the House of Commons on Oct. 22 with regard to the proposed introduction of legislation concerning war damage to public utilities, from which it appeared that it was hoped to introduce a Bill as early as possible in the new Session.

The existing representatives of the Council on the Grand Council of the Federation of British Industries were re-appointed as follows:

(*a*) *Main Group* 9, *Section* 1 (*Chemical Fertilizers and Explosives*).—Mr. E. V. Evans (who also represents the Association of British Chemical Manufacturers on the Grand Council) and Mr. W. Gordon Adam.

(*b*) *Main Group* 14, *Sub-Group* 3 (*Public Utilities*).—Mr. J. Terrace, Colonel H. C. Smith, and Lt.-Col. Sholto S. Ogilvie.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in the "Journal" should not be taken as an indication that they are necessarily available for export.

Gas Products Prices

The London Market Nov. 16.

The only item of interest in connexion with the London Coal Tar Products market is that fair quantities of Pitch are being sold on the basis of 45s. per ton naked at Makers' Works. Otherwise no change.

The Provinces Nov. 16.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 90's, 1s. 10d., pure, 2s. 5d. (controlled by the Control of Toluene No. 2 Order, July 3, 1941, which fixes the maximum price at which this material may be sold). Coal tar, crude naphtha, in bulk, North, 1s. to 1s. 4d. according to quality. Solvent naphtha, naked, North, 2s. 2d. to 2s. 6d. Heavy naphtha, North, 1s. 10d. to 1s. 11d. Carbolic acid, 60's, controlled by the Coal Tar Acids Prices (Inland) Order, 1942, operative from May 1. Naphthalene, controlled by the Naphthalene prices (Inland) Order, 1942, dated April 15, 1942, and operative from May 1, 1942, £19 to £19 10s.—bags free. Anthracene, controlled by the Anthracene Prices (Inland) Order, 1942, operative from May 1. Filtered heavy oil (min. gr. 1,080), 7½d. to 8d. Creosote oil has been generally controlled as to direction and price for some time past. Current value—fuel grades 5d. to 5½d; timber preservation and other purposes 4½d. to 6d. These prices apply as from May 13.

* In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 of the "JOURNAL" for Sept. 10, 1941.

Tar Products in Scotland Nov. 14.

The Control of Coal Tar (No. 2) Order is more comprehensive, but affects the position very little. Prices are firm. Refined tar controlled. Value is 4½d.* per gallon *ex* Works, naked. Creosote oil: Specification oil, 6¾d. to 7d.; low gravity, 7¼d. to 7½d.; neutral oil, 6¾d. to 7d. per gallon; all *ex* Works in bulk. Refined cresylic acid is available in small quantities at 3s. 6d. to 4s. 6d. per gallon *ex* Works, naked, according to quality. Crude naphtha: 6¾d. to 7d. Solvent naphtha: 90/160 grade, 2s. 5d. to 2s. 6d., and 90/190. Heavy naphtha, 1s. 11d. to 2s. per gallon. Pyridine: 90/160 grade, 13s., and 90/140 grade, 15s. per gallon.

Gas Stocks and Shares

The North African news gave a decided fillip to markets at the opening last week and on Monday markings reached a new record. Despite a continuance of good news, however, the increased activity was short lived, and with profit-taking in evidence markets turned reactionary with the exception of British Funds and other high-class investment issues. The Gas Market followed the trend of the latter and attracted a steady demand throughout the week. A number of stocks in the Official List were marked up, although the improvement did not extend to those stocks quoted in the Supplementary List or on the Provincial Exchanges. Commercial ordinary advanced a further 5 points to 47½, which compares with 33¼ on the 1st January. Gas Light units, after a slight set-back the previous week, improved 9d., while Imperial Continental gained 6 to 80½, or 25 points higher than at the commencement of the year. It will be seen that a number of other ordinaries also closed a few points higher.

The following quotations were changed during the week:

OFFICIAL LIST

Associated Gas & Water Undertakings Ord. (*x.d.*)	17/6—18/6	Nov. 9
Ditto Deferred (*x.d.*)	17/6—18/6	,,
Ditto 4½ p.c. Red. Cum. Pref. (*x.d.*)	17/—18/–	,,
Ditto 4 p.c. Red. Cum. Pref. (*x.d.*)	17/—18/–	,,
Ditto 4 p.c. Cum. Pref. (*x.d.*)	13/6—14/6	,,
Bournemouth max.	137—142	+2
Commercial	45—50	+5
Gas Consolidation "B" Ord. (*x.d.*)	15/—17/–	Nov. 9
Ditto 4 p.c. Red. Cum. Pref. (*x.d.*)	14/6—16/6	,,
Gas Light Units	15/6—17/6	+–/9d.
Ditto 4 p.c. Pref.	78—83	+3
Imperial Continental	78—83	+6
Montevideo Ord.	87—92	+2
Portsmouth Cons.	100—105	+4
South-Eastern Gas Corporation	16/—17/–	+–/3d.
South Metropolitan Ord.	70—75	+3
Ditto 4 p.c. Pref.	72—77	+2
South Suburban Ord.	80—85	+1
United Kingdom Gas Corporation Ord. (*x.d.*)	16/9—17/9	Nov. 9

SUPPLEMENTARY LIST

Gas Consolidation "A" Ord. (*x.d.*)	15/—17/–	Nov. 9

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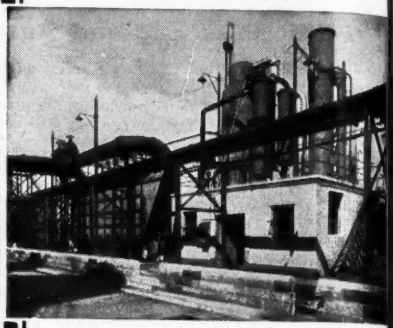

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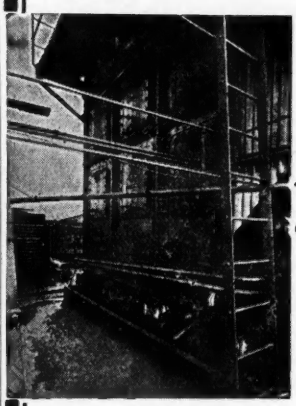

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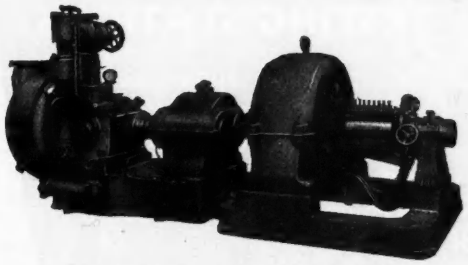

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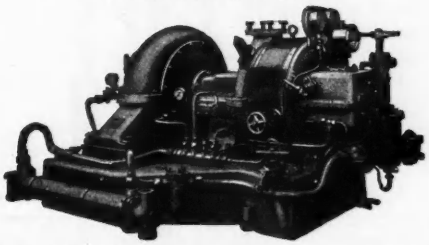

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